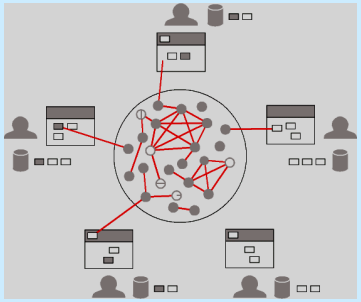
ONR Collaboration and Knowledge Management (CKM) Workshop

Overview and Objectives

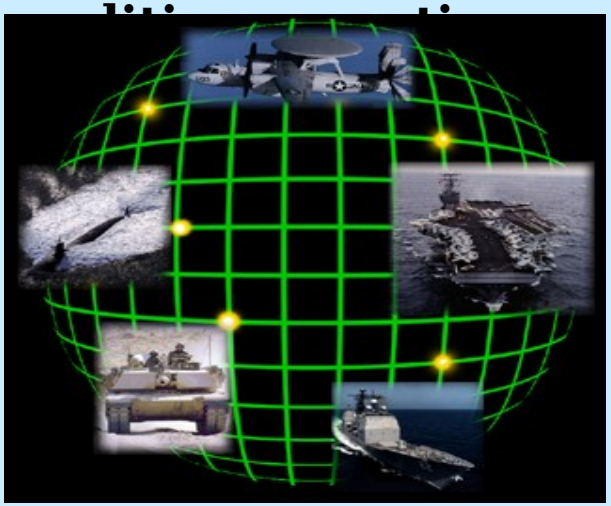


- Requirements
- Problem Characteristics
- Capabilities Required
- Program Overview
- Conceptual Model/Taxonomy
- Program Content
- Future Directions

The Requirement

Requirement for Collaboration Technology

- Increasing problem complexity– team effort needed
- IT/Communications technology widening accessibility of contributors
- Problems addressed at international level – coalitions required
- Defense Transformation to agile and
- Information overload conditions

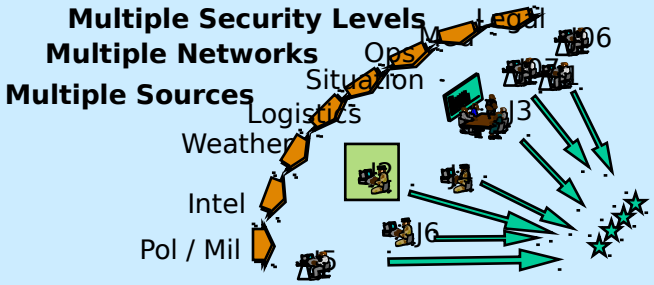


Some Examples

- International humanitarian relief effort
- Multinational response team in Afghanistan
- International automobile design team

Problem Characteristics

General



- **Distributed participants**
- **Multidisciplinary contributors**
- **Technology supported**
- **Changing participants**
- **Complex, data-rich Environment**
- **Distributed and unshared knowledge**

Military

- **Operations with Joint, Coalition, Non-Government and Volunteer Organizations**
- **Asynchronous and Distributed Command Level Decision Making**
- **Asymmetric Warfare**
- **Dealing with Open-Source (Uncertain, Conflicting, Partial, Non-Official) Data**
- **More Focus on Humanitarian Relief, Disaster Aid and Politically-charged Operations**
- **Rapidly Changing Team Members and Associated Organizational Structures**
- **Culturally Diverse Partners**

Capabilities Required

- **Cultural/Language/Experience-Free Representation and Transfer o**

Knowledge

- **Tools for building and management of team knowledge**
- **Team Situational Awareness Metrics**
- **Team analysis of large-volume, uncertain data**
- **Computational models of Team Reasoning/Course of Action**

Selection

- **Distributed and asynchronous collaboration and virtual command**

presence

- **Distributed/asynchronous performance equivalent to co-located**

Program Overview

Objective

Develop cognitive science-based tools, models, computational methods, and human-agent interfaces to help attain common situational awareness among heterogeneous, distributed team members engaged in asynchronous, quick response collaboration for issue resolution, course of action selection or decision making.

Technical Issues

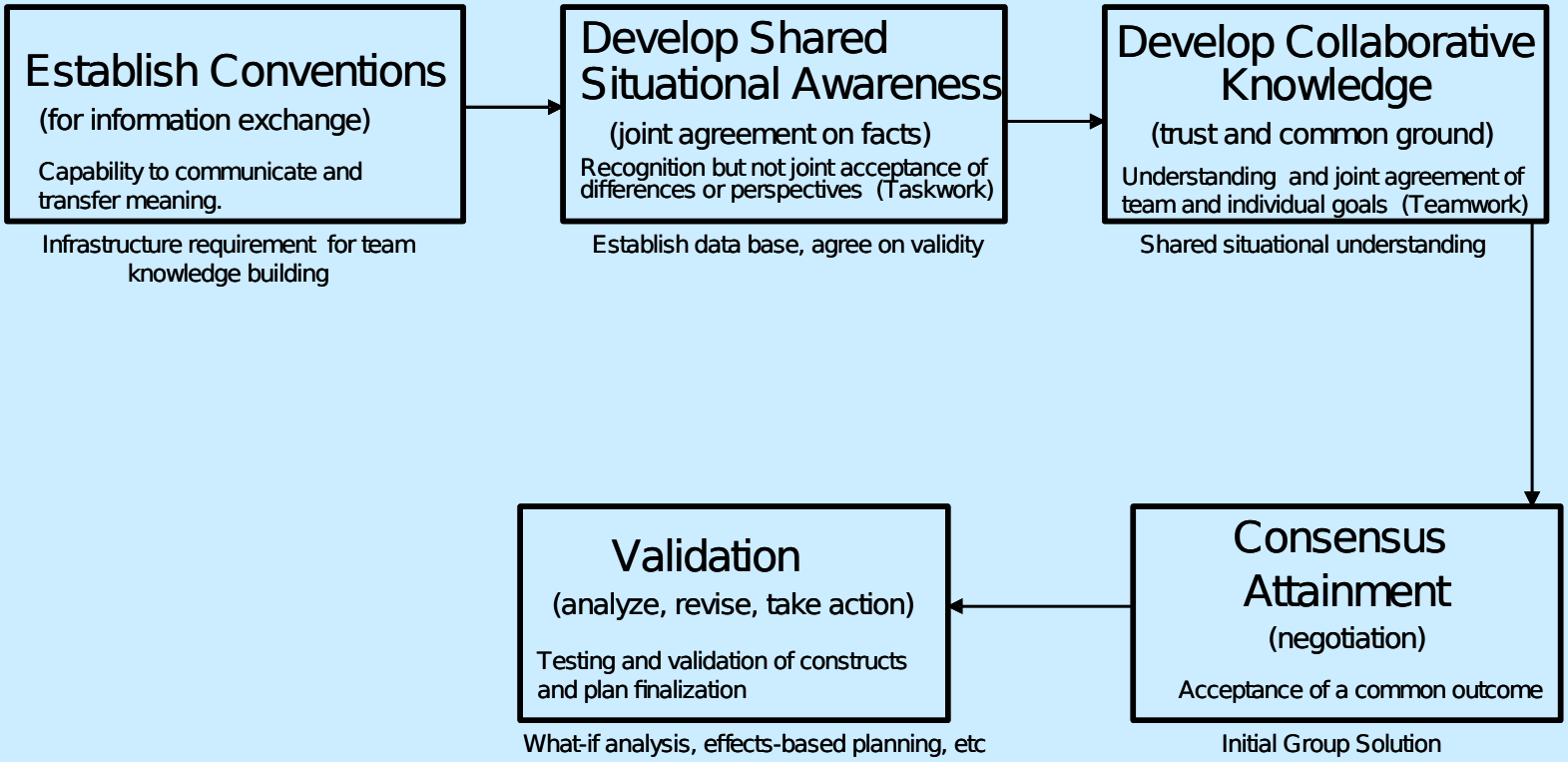
- **Representation and transfer of meaning**
- **Group knowledge elicitation and management**
- **Mental model development and convergence**
- **Quick development of shared understanding among participants**
- **Collaboration facilitating tools and performance metrics**
- **Conceptual and computational models of collaboration**
- **Standards for human-centric agent design**

Scope

- **Not IT/Computer Science but enabling technology**
- **Not Human Behavior, Social science**
- **Not Human performance Modeling**

Five Functions of Effective Collaboration:

A Human Information Processing Model of Joint Problem Solving


Establish Conventions
(for information exchange)
Capability to communicate and transfer meaning.
Infrastructure requirement for team knowledge building
Develop Shared Situational Awareness
(joint agreement on facts)
Recognition but not joint acceptance of differences or perspectives (Taskwork)
Establish data base, agree on validity
Develop Collaborative Knowledge
(trust and common ground)
Understanding and joint agreement of team and individual goals (Teamwork)
Shared situational understanding
Consensus Attainment
(negotiation)
Acceptance of a common outcome
Initial Group Solution
Validation
(analyze, revise, take action)
Testing and validation of constructs and plan finalization
What-if analysis, effects-based planning, etc

Program Structure

Representation And Transfer of Meaning

– Effective Diagrams in Decision Support (EDDS)
Stanford
– Augmented Reality Visualizations for Shared Understanding (AUGVID) UCSD
– Modeling Computer-Mediated Joint Activity (CJA)
Brandeis
– Hybrid Collaborative Environments (HCE)
UCSD

Team Cognition

– Decision Making Constructs in a Distributed Environment (DECODE)
SPAWAR
– Shared Information Virtual Surfaces (SIVS)
Col. State
– Mental Model Convergence (MMC)
UMASS
– Distributed Cognition (DISCOG)
Penn State
– Critical Thinking in Team Decision Making (SBIR)

Program Direction

- **Focus on specific products and validated science-based tools**
- **Use/partner with other enabling technology (computer science)**
- **Leverage other cognitive science tools (current projects in program)**
- **A conceptual model of collaboration and unresolved technical issues**
- **Understand and start planning for military**

Future Capability Targets

- **Crisis/Problem Prediction**
- **Define Collaborative Performance Metrics**
- **Reconfigurable Information Fusion**
- **Decision Making through Synthetic Experience**
- **Context Sensitive Filters**
- **Consultive Advisors**
- **Develop Cognitive Ergonomics Guidelines**
- **Real-time What-if Analysis**
- **Agent Interfaces that react to human variation**

Five Functions of Effective Collaboration:
A Human Information Processing Model of Team Cognition and Joint Problem Solving